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ABSTRACT

A study examined the main and interacting effects of pragmatic, structural, and word-level manipulations of text on comprehension and compared the results to the effects of these variables on judgments of text comprehensibility and interest. Subjects were 120 seventh grade students who read a number of passages that differed in level of familiarity, "goodness" of structure, and vocabulary difficulty. The students either rated the comprehensibility of each passage or answered a number of comprehension questions based on each passage. Both comprehensibility judgments and comprehension performance were positively related to topic familiarity and good story structure. Vocabulary difficulty was negatively related to performance on the comprehension measure only. (Appendixes contain copies of the stories and the comprehension questions used in the study.) (Author/FL)

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CENTER FOR THE STUDY OF READING

Technical Report No. 190

CONTRASTING THE EFFECTS OF SOME TEXT VARIABLES ON COMPREHENSION AND RATINGS OF COMPREHENSIBILITY

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Abstract

Students read a number of passages which differed in level of familiarity, goodness of structure, and vocabulary difficulty, and either rated the comprehensibility of each passage or answered a number of comprehension questions based on each passage. Both comprehensibility judgments and comprehension performance were positively related to topic familiarity and good story structure. Vocabulary difficulty was negatively related to performance on the comprehension measure only. Implications for research on metacomprehension are discussed.

Contrasting the Effects of Some Text Variables on Comprehension and Ratings of Comprehensibility

Research involving reading comprehension has recently begun to distinguish between the ability to understand (e.g., recall and recognize information) and the ability to monitor one's understanding of the text (e.g., judge the level of one's understanding). The former has been the focus of reading research for the past several decades, with investigations into various factors as each influences text comprehension (e.g., Anderson & Freebody, 1979; Bransford & Johnson, 1973; Rothkopf, 1966; Stein & Nezworski, 1978). The latter has recently emerged as an area of concern to reading researchers based on general work in metacognition (Flavell, 1976; Flavell & Wellman, 1977), and more specifically, work in metacomprehension (Brown, in press; Markman, 1977; Winograd & Johnston, 1980).

The purpose of this investigation is to compare the effects of variables at the word, discourse, and knowledge levels on a measure of comprehension and one of metacomprehension. We will first give a brief introduction relating the areas of comprehension and metacomprehension, then will define our independent variables as operationalized in this study. Next, we will discuss our selection of dependent measures in both areas, and finally we will describe the experiment.

Relationship between Comprehension and Metacomprehension

The purpose of reading has been described as comprehension of the text, with the criterion for understanding set by the reader based on the goal of the reading activity (Brown, in press). A multitude of factors that influence the reader's understanding of text have been identified, factors such as ability (Olshavsky, 1976-77; Raphael, Winograd, & Pearson, Note 1), the use of adjunct questions (Frase, 1968; Anderson & Biddle, 1975), text structure (Stein & Nezworski, 1978), word difficulty (Wittrock, Marks, & Doctorow, 1975), or context (Bransford & Johnson, 1973). The majority of this research has tended to focus upon text variables and, as the research has demonstrated, variations in characteristics of text can have a large impact on the reader's ability to comprehend what he or she has read.

The research in metacomprehension, rather than focusing on the reading process itself, investigates both the reader's awareness and control of the reading process. Awareness of the reading process concerns a person's knowledge (conscious or unconscious) of his or her personal cognitive resources. These resources are the stable sources of information available to the learner regardless of the context. Control or self-regulatory mechanisms are those less stable indices of information that depend upon both the learning situation and the learner's expertise. Therefore, it is not surprising that studies concerning metacognition have emphasized either what readers know about the reading process or how readers regulate the ongoing reading process. Flavell (1976) delineates three types of variables pertinent to investigations into metacognitive knowledge: (a) person variables, what one knows about

oneself and other people as cognitive processors; (b) task variables, information available during the task, or knowledge of task demands; and (c) strategy variables, those invoked to monitor understanding.

To illuminate the relationship between comprehension and metacomprehension, it seems promising to investigate in what way variables known to affect the former will influence the latter.

Some Variables that Influence Comprehension

Of the many variables that can affect comprehension, three were selected for manipulation in comparing comprehension and metacomprehension. The three represent person and task variables known to affect reading comprehension. The first is word frequency, a task variable most likely to influence comprehension at the word and sentence levels. A second task variable to be manipulated is that of structure, a variable likely to affect comprehension at the discourse level, that is, the integration of episodes into the general pattern of the story. The third is topic familiarity, a person variable likely to provide information about processing at the level of interpreting the theme of the story in terms of personal knowledge.

The importance of word knowledge in reading comprehension has been recognized for some time. Correlational and factor-analytic studies have indicated that word knowledge and verbal reasoning ability account for almost all the variance in standardized comprehension measures (Davis, 1944, 1968; Spearitt, 1972; Thorndike, Note 2). Yet, experimental studies of the effects of word knowledge on reading comprehension have not produced such clear results. Wittrock and his co-workers (Marks, Doctorow, & Wittrock, 1974;

Wittrock, Marks, & Doctorow, 1975) found that passages in which 15% of the words had been changed to lower-frequency synonyms led to about a 25% decrease in performance on subsequent comprehension questions. They also found that direct instruction on the rare words could increase the performance of the low-word-frequency group. Jenkins, Pany, and Schreck (1978), however, failed to replicate either of these findings and found that whereas vocabulary training transferred to single sentences containing target words, there was no effect due to increased word knowledge on broader measures of comprehension. They suggested two possible explanations for this failure to transfer, the first related to the power of the instructional methodology, the second to the proposition that readers can cope with a high proportion of unfamiliar words without too much disruption to their understandings, particularly if the topic of a passage is familiar to them. General knowledge of the theme may allow the reader to construct highly plausible meanings. This is, in effect, a hypothesis about an interaction. Word difficulty has not been related to comprehensibility ratings, possibly because of the obviousness of the result of a main-effects test. Yet its role in interaction with pragmatic and structural variables may not be so predictable.

Our knowledge of how texts are typically structured and the role of that knowledge in encoding, recall, and judged comprehensibility are currently the objects of considerable study, particularly in the context of simple stories. It has been shown, for instance, from recall protocols, that subjects tend to organize output according to a "normal" or "ideal" structure, even when the stories they originally read are poorly or randomly structured. Thorndyke

(1977) presented subjects with one version of a story written in one of four ways: (a) intact (that is, "normal" structure), (b) with the theme after the conclusion, (c) with the theme deleted, and (d) without any causal or temporal continuity. He found that recall completeness decreased with the decrease in the quality of structure, as did subjects' hit rate for true statements in a recognition task. He also found that the false alarm rate for similar and logically derivable sentences decreased as structure decreased, suggesting that, at the point of encoding, less incegration of the story with existing knowledge had occurred for the more poorly structured stories. Stein and Nezworski (1978) confirmed these results and, in addition, examined the effects of instructions to recall verbatim versus to "make a story." They found interactions between the degree of structure in the story and the type of instructions.

There is also evidence that by about age 10, school children are beginning to become aware of organizational aspects of texts and of their utility in understanding and recall (Danner, 1976). The materials used, however, were overly simple and did not reflect, in content or structure, the typical reading experiences of the subjects. In a study by Thorndyke (1977), college students' mean comprehensibility ratings of texts with decreasing structure declined with the decrease in the quality of structure. These stories were more like the subjects' normal reading, but it has not been shown that these effects are robust either for children or for passages about which subjects possess different degrees of pragmatic knowledge.

One aspect of a reader's overall familiarity with a topic domain is his knowledge about the pragmatic constraints that apply in it. It has been documented that topic familiarity affects comprehension and recall. Spilich, Vesonder, Chiesi, and Voss (in press), for example, tested groups high and low on baseball knowledge on their recall of a report of a baseball game. High prior knowledge was related to better recall of (a) the goal structure of the game, the important variables and their possible values, (b) the game actions and their relevance to the goal structure, and (c) the sequences and state changes involved in the development of the game. Anderson, Reynolds, Schallert, and Goetz (1977) found that interpretation and recall of ambiguous passages was predictable from knowledge of the subjects' areas of expertise. Music and physical education majors read a passage which could be interpreted as a wrestling match or a prison break, and another about a group of people meeting to play either cards or musical instruments. Subjects introduced predictable background-related elements into their recalls and many reported being aware of only one interpretation. At a more dramatic level, Bransford and Johnson (1973) have shown that a passage they wrote (about washing clothes) can be almost totally incomprehensible and unrecallable without the title but quite easily comprehended and recalled with the title. Initial access of the relevant knowledge, in this case, provides the only framework for understanding and recall.

To summarize thus far, we have considered three variables, from the word to the discourse to the knowledge level, to be of relevence and interest in this investigation; the general purpose of the study was to examine the main

and interacting effects of pragmatic, structural, and word-level manipulations of text on comprehension, and to compare these results to the effects of these variables on judgments of text comprehensibility and interest.

Method

This investigation involves two separate experiments, though in both studies stories and interest ratings were identical. Therefore, for purposes of clarity, those features common to the two studies will be described. Then the materials and procedures unique to each study will reported under Experiments 1 and 2.

Subjects

One hundred and twenty seventh-grade students in six classrooms from two central Illinois junior high schools participated in the study. Students ranged in ability from below average (reading up to 2 years below grade level) to above average (reading beyond the seventh grade level). Ability levels were determined on the basis of reading comprehension scores from the Stanford Achievement Test administered in Spring, 1979. The scores of students reading more than two years below grade level and those labeled "language disabled" were not included in the data.

An important prerequisite to the comparison of comprehension performance with judgments of comprehensibility is the equivalent of the two groups of students. This was determined by our examination of the reading achievement scores for the two groups. Standardized reading vocabulary (RV) and reading comprehension (RC) means and standard deviations for the two groups were:

School A: RV: $\underline{x}$ = 59.15 ($\underline{SD}$ = 25.97)

B: RV: $\underline{x}$ = 54.07 ($\underline{SD}$ = 24.30)

A: RC: $\underline{x}$ = 56.29 ($\underline{SD}$ = 29.11)

B: RC: $\underline{x}$ = 56.73 ($\underline{SD}$ = 26.74)

$\underline{T}$-tests for the two comparisons indicated that the difference between means was not significantly different (RV: $\underline{t}$ = .77, $\underline{df}$ = 58; RC: $\underline{t}$ = .06, $\underline{df}$ = 58). It can be assumed, then, that the two groups were of equivalent reading ability.

Three classrooms in one junior high school were assigned to the comprehension experimental procedures; three classrooms in the other junior high school were assigned to the metacomprehension experimental procedure.

Since our particular interest in this study was in the effects of text variables rather than in a given student's performance on comprehension and metacomprehension questions, a between-subjects design was felt to be appropriate. This feature avoids practice effects and effects of serial desirability associated with questions on particular pieces of information presented in different modes. It also permits more efficient use of students' time, and given the assumed equivalence of the groups, does not impede interpretation of the results in terms of the variables of interest. Within each classroom, students were randomly assigned to conditions (order of passage presentation, or "list").

Materials

Passages. Four underlying themes (construction, intervention of higher authority, arbitration, and territorial rights) were used as a basis for constructing the passages. The themes were developed in passages of

approximately 300 words in length, following Van Dijk's (1977) suggested macrostructure of exposition, complication, and resolution. The exposition consists of the setting information, characters, and background information leading to the complication. The complication of an episode is "something surprising, remarkable, or at least interesting" (p. 38). The resolution involves the solving or resolving of the problem in the complication (see Table 1).

Insert Table 1 about here

Each theme had two instantiations, one passage familiar and one unfamiliar to sixth-grade children, with familiarity operationalized in terms of the pragmatic constraints involved in the situation. A passage was defined as familiar if the protagonists were individuals and the problem one that dealt with known entities within the child's range of experience. An unfamiliar passage was defined as one concerned with more abstract protagonists such as corporate entities, and the problem one of corporate interaction or decision-making. Thorndyke (1977) argued that concreteness increases imagery which facilitates comprehension. With more concrete content, the reader can attribute to the characters actions that are "stereotypical of their normal behavior, [thus] extra-experimental knowledge could be brought to bear [on the passage]" (p. 98). It was assumed that children would possess less extra-experimental knowledge of corporate entities than of individuals. The two passages were parallel throughout, changing only those words necessary to achieve the two different levels of familiarity. Without sacrificing story

cohesiveness or meaningfulness, the instantiations of each theme were matched at the word level (see Table 2).

Insert Table 2 about here

The structural manipulation consisted of exchanging the complication and the resolution. In a well-structured story, the order of exposition, complication, and resolution was preserved. In a poorly structured story, the order was exposition, resolution, and complication. Kintsch (1977) proposes that the reader brings a set of expectations about the structure of a story to any passage he or she is to read. The expectation specifically involves finding the exposition of the first episode, followed by a complication and resolution. When the order of the complication and resolution were changed, the materials were expected to violate the reader's set of expectations.

To manipulate word frequency, 15% of the words in each passage were changed. For example, in the high-word-frequency version of one of the stories ("Trouble Between Sisters"), the mean frequency index (i.e., SFI from Carroll, Davies, & Richman, 1971) was 62.58 (SD = 10.65), and for the low-frequency version the mean was 47.56 (SD = 8.48).

In summary, a total of 32 different passages were developed based on the four themes and the three manipulations. Each theme had a familiar and an unfamiliar passage. For each passage, there was a well-structured and a poorly structured version in both high- and low-frequency words. Thus, there were eight possible versions for each of the four scripts (see Appendix A).

Interest assessment. In both experiments, subjects rated each story on a four-point interest scale, ranging from "very interesting" to "not at all interesting." A brief explanation of the scale was given to the students during the oral instructions of the experiment.

Design

Two experiments were designed to assess the effects of pragmatic, structural, and word-level manipulations of text, comparing the effects of these manipulations on three dependent measures. The measures used were designed to assess judgments of comprehensibility of text, judgments of performance using the text, and degree of interest in the text. The variables topic familiarity (familiar and unfamiliar), structure (good and poor), and word frequency (high and low) were combined factorially to yield a 2 x 2 x 2 experimental design. Topic familiarity and structure were varied within subjects, while word frequency was a between-subjects factor (see Table 3).

Insert Table 3 about here

For purposes of counterbalancing, a Graeco-Latin square was constructed with the four scripts or themes as one variable and with the four topic familiarity/structure treatment combinations as the second variable (see Table 3). Four lists of stories were constructed corresponding to the rows of the square. Thus, each script was assigned to each of the treatment conditions, and also to each of the ordinal positions within the list. In total, eight lists were constructed, four each for the high- and low-word-frequency conditions, for both experiments.

Experiment 1: Judgments of Comprehensibility of Text

Dependent Measure

The dependent measure consisted of two questions designed to assess the subjects' cognitive monitoring: (a) judgments about the difficulty of the passage, and (b) predictions about performance on a test over the story (see Appendix B for examples). Response to the questions was measured on a four-point rating scale. Responses were then combined to form one dependent measure of cognitive monitoring or judgment of comprehensibility.

Procedure

Subjects, randomly assigned to list within classrooms, were each given a booklet consisting of four stories followed by four identical sets of three questions. The first two were those measuring the subject's judgment of text comprehensibility and individual performance; the third indicated how interesting the text seemed to be. Children were told that this study involved understanding how readers decide whether a story is difficult or easy, and that they would be asked to read some stories and rate them on two different rating scales. The scales were then described. Following this, the students were told to read the four stories, then to rate each story on each of the three questions. While they were allowed access to the stories at all times, they were not encouraged to refer back to them. All children were able to complete the task within 30 minutes.

Results

Preliminary analysis. The first step taken in the analysis of the metacomprehension data was determining the intercorrelations of the three rating scales. Reading ease correlated .53 with prediction of test performance, suggesting that these two scales involved similar kinds of assessment on the part of the reader. Much of this overlap may be due to the common method of measurement. Evidence was also found that suggested these kinds of judgment processes were distinct from judgments of interest. The correlations of the two factors of reading ease and prediction of test performance with the factor of interest were .23 and .28, respectively. These findings together suggest that one metacomprehension score could be formed by combining the reading ease and prediction of test performance scores, and that this composite scale measures something distinct from interest.

Analysis of metacomprehension data. An analysis of variance was performed on the composite metacomprehension score with list and word frequency as between-subjects factors and with topic familiarity and structure as within-subjects factors.

A significant main effect was found for topic familiarity, $F(1,56) = 44.95$, $p < .01$). There was a tendency for better structured stories to result in higher rated comprehensibility, $F(1,56) = 3.61$, $p < .065$). Table 4 shows that in both cases results are in the expected direction; high familiarity and well-formed structure result in higher ratings.

Insert Table 4 about here

In the case of structure, a discrepancy exists between ratings of reading ease and predictions of test performance. For reading ease, there is no effect for structure, $F(1,56) = .81$ (M good-structure = 3.35; M poor-structure = 3.24). However, for prediction of test performance the difference was small but significant, $F(1,56) = 4.76$, $p < .05$ (M good-structure = 3.23; M poor-structure = 3.04). These findings suggest that story structure influences a reader's decision about how easy a story is to read differently from decision about possible test performance.

There was a significant interaction involving list, word frequency, and familiarity, $F(3,56) = 3.80$, $p < .02$. This suggests that the interaction of word frequency and familiarity depends upon the list of stories read (see Table 5).

Insert Table 5 about here

Careful inspection of these means reveals that in all lists but Number 4, low-frequency stories result in lower ratings than do high-frequency stories when the topic is familiar. Also, in all lists but Number 3, there is little difference in mean ratings between high-and low-word-frequency stories with unfamiliar topics. Note, however, that this suggested interaction where word frequency has an effect only with familiar topic stories is completely true only for Lists 1 and 2. These data suggest that the word frequency by topic familiarity interaction depends upon the level of a third variable for which the present reseach has not controlled.

The lack of a main effect for word frequency, $F(1,56) = .73$, or an interaction between word frequency and topic familiarity was initially surprising. This result was probably due to the nature of the factor in this particular design. As a between-subjects factor, it was difficult to establish the effect of word frequency since a relative rating scale was used. Subjects would not likely be made aware of the factor and would thus be unlikely to take it into consideration.

Experiment 2: Comprehension Performance on Probe Questions

Dependent Measure

Ten multiple-choice questions were developed for each story. Five questions probed general recall for textual information, three assessed knowledge at the word level, and two measured beyond-the-text knowledge of the topic. In one case of the topic-knowledge assessment, a distractor was designed to highlight the effect of the structural manipulation (see Appendix B).

Procedure

Students were tested by classroom, each student using a test booklet that consisted of four stories. Each story was followed by an interest rating and the ten appropriate probes. Access to stories was not permitted during the students' response to the probes. Once the initial oral instructions were given, students worked individually at their preferred pace. The task took approximately 40 minutes.

Results

The ten multiple-choice comprehension questions were designed to assess recall of detail information, understanding of vocabulary, and the inferences drawn, using five, three, and two questions for each respective category. In order to obtain an overall comprehension score that reflected equal contributions of the three kinds of information, z-scores were computed for each of the ten items. These scores were then averaged within question type and then averaged again to yield an overall comprehension score (see Table 6).

Insert Table 6 about here

The control variable list was omitted, since an initial analysis of variance showed it to have no effect. Analysis of variance with word frequency as a between-subjects factor and familiarity and structure as within-subjects factors revealed no interaction effects or even "trends in the expected direction." Main effects were found for topic familiarity, word frequency, and text structure (see Table 7).

Insert Table 7 about here

High-word-frequency stories resulted in better comprehension, $F = 18.21$, $p < .01$. Stories about more familiar topics were comprehended slightly better than those about less familiar topics, $F(1,56) = 10.28$, $p < .01$. There was also a slight advantage in comprehension for stories with good structure as compared to those with poor structure, $F(1,56) = 4.09$, $p < .05$.

Because these effects were small, it was decided to examine the data more closely to see if the effects of word frequency, topic familiarity, and structure were different in any way for good and poor readers. Good and poor readers were defined by their performances on the Stanford Achievement Reading Test (Total Score). Good readers scored in the top quartile and poor readers in the bottom quartile based on national norms.

Inspection of these means suggests that there was little effect for topic familiarity for poor readers, and no effect at all for good readers. Word frequency appeared to have a uniform effect for both types of readers. There was, however, the suggestion that structure does affect poor readers and good readers differently. Poor readers seemed to be adversely affected by the poor-structure condition, while good readers seemed to be relatively unaffected (see Table 8).

Insert Table 8 about here

These reading ability by treatment interactions were tested with regression analysis. Neither interaction suggested reached significance: topic familiarity x ability, $F(1,231) = 2.49$, $p < .12$; structure x ability, $F(1,231) = 1.13$, $p < .29$.

One inference question was designed to be particularly sensitive to the structure manipulation. A subject's choice of one distractor indicated that comprehension had been impaired by exchanging the story resolution and complication. Choice of this distractor can be considered a second dependent measure.

Analysis of variance on this variable resulted in only a trend toward significance of a main effect for structure, $F(1,50) = 3.48$, $p < .07$. The poor-structure condition had a mean of .128 versus a mean of .062 for the good-structure condition.

To see if there was any reading ability by structure interaction, analysis with reading ability as a factor was performed. There were no differences between poor and good structure stories for the good readers, but differences did appear for poor readers (see Table 9).

Insert Table 9 about here

In this case, regression analysis revealed a reliable ability by structure interaction. The reading ability x structure interaction increased the proportion of variance accounted for, $F(1,231) = 5.29$, $p < .05$. The simple correlations between the dependent variable and reading ability were -.149 for good structure and -.360 for poor structure, the latter correlation significant at $p < .01$. Thus, the interaction was essentially ordinal in form, as suggested by the extreme groups comparison.

General Discussion

Conclusions

Based on the combined results of Experiments 1 and 2, it seems obvious that the factors of topic familiarity, text structure, and word frequency affect students' performances on measures of comprehension and of metacomprehension in highly similar manners, and in expected directions. On both measures, scores were higher for passages using familiar topics and good

structure. On the comprehension measure, students' performances were higher in the high-word-frequency condition. In addition, good readers tended to score higher on the comprehension probe questions than did poor readers.

An interesting result can be observed in the data from the distractor item on the comprehension inference probe. Recall that choice of one distractor was indicative of confusion that would be predictable based on the poorly structured text. Poor readers were affected to a greater degree than the good readers, as evidenced by their tendency to select the distractor item.

Future Research

There are two implications for future research that follow from the previous studies. The first concerns the need to investigate the ability to comprehend and the ability to perform successfully on metacomprehension tasks within an individual reader. The second is concerned with a possible methodology for identifying points at which material ceases to be comprehensible.

These studies establish a connection between performance on comprehension and on metacomprehension tasks. However, there is a definite need to specify the nature of this relationship. While it is intuitively clear that there exists a good-poor reader distinction on both measures, there is no indication whether this distinction is stable across the two measures. That is, what now needs to be demonstrated is whether a good comprehender is also a good metacomprehender, a poor comprehender also a poor metacomprehender, or whether the reality is that the two skills are not consistent within a single reader. While we predict that in the majority of readers the correlation between

measures of comprehension and metacomprehension would be high, it is not unreasonable to expect to find someone who is unable to comprehend a passage and to be quite aware of any inadequacy, or for someone to think that they are quite unable to read and understand a passage, yet be able to explain it adequately at a later time.

The second implication of this study is methodological. The success of the distractor item on the multiple-choice comprehension probes indicates that this may be a means for specifying exact points of breakdown in comprehension. In addition to identifying a location in the text that serves to confuse the reader, it can also help identify the ways in which the reader may become confused, yet not turn to a "fix-up" strategy. By selecting a specific distractor item over the correct answer, the reader is indicating exactly what type of inference was required to make sense of the text.

These studies have served as an exploration into the area of text and reader variables as they influence the reader's abilities to understand a passage, as well as recognize any communication breakdown during reading. While there is much to explore, it seems reasonable to conclude that although two constructs, comprehension and metacomprehension, exist, there is a great deal of overlap between the two. This is perhaps due to the role of the "executive" in cognitive functioning, to the similarity in task demands, to the necessary integration of the two by the successful reader, or to any number of variables not yet considered. Future research should concern itself with identifying where the overlap lies, and what implications this information has for the fields of psychology and education.

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Appendix A: Stories

Theme 1 - Construction

Structured - High frequency - Familiar

The Treehouse

There were two things Mary had always wanted - a place to be alone and a place that was for bird watching. Her family was now renting a home in a big city. Mary decided that there was one way she could get both of these things. In the back yard away from the house, they had a large tree. She made up her mind to build a treehouse in that tree. That way she could do the things she wanted and have a pleasant place to watch birds.

Clearly she could not build it on her own, so she talked to her brother and some of his friends, and some of her own friends. Soon they got all the materials together and the building began.

When the building was about a third of the way through, Mary's parents came out to look at what was happening. Immediately, her parents said that the building would have to stop because the tree was untouched and very beautiful. They said that people climbing up and down would ruin the life of the tree after a while.

Mary did not know what to do. One of her friends said that they could change the treehouse into a birdhouse to feed large numbers of birds. In this way, once the building was finished, no branches would be broken. She decided to do this, and soon the building was finished.

Things turned out even better for Mary because she enjoyed herself even more by watching all the birds that came into the tree more regularly, and she could watch all alone - on the back porch.

Theme 1 - Construction

Structured - Low frequency - Familiar

The Treehouse

There were two things Mary had perpetually wanted--a place to be alone and a place that was for bird watching. Her family was currently leasing a home in a sizeable city. Mary ascertained that there was one way she could attain both of these things. In the backyard away from the house, they had a substantial tree. She was determined to construct a treehouse in that tree. That way she could do the things she wanted, and have a salubrious place to watch birds.

Obviously she could not construct it single-handed, so she consulted her brother and some of his companions, and some of her own companions. Soon they gathered all the materials together and the construction commenced.

When the construction was approximately a third of the way through, Mary's parents came out to examine her progress. Unhesitatingly, her parents declared that the construction would have to cease because the tree was pristine and very splendid. They claimed that scaling up and down would devastate the life of the tree eventually.

Mary did not know how to react. One of her companions suggested that they could modify the treehouse into a bird house to feed large numbers of birds. In this fashion, once the construction was completed, no branches would be broken. She opted to do this, and soon construction was completed.

Things eventuated even more favorably for Mary since she enjoyed herself even more by watching all the birds that came into the tree more regularly, and she could watch all alone on the back porch.

Theme 1 - Construction

Unstructured - High frequency - Familiar

The Treehouse

There were two things Mary had always wanted - a place to be alone and a place that was for bird watching. Her family was now renting a home in a big city. Mary decided that there was one way she could get both of these things. In the back yard away from the house, they had a large tree. She made up her mind to build a treehouse in that tree. That way she could do the things she wanted and have a pleasant place to watch birds.

Clearly she could not build it on her own, so she talked to her brother and some of his friends, and some of her own friends. Soon they got all the materials together and the building began.

Mary did not know what to do. One of her friends said that they could change the treehouse into a birdhouse to feed large numbers of birds. In this way, once the building was finished, no branches would be broken. She decided to do this, and soon the building was finished.

Things turned out even better for Mary because she enjoyed herself even more by watching all the birds that came into the tree more regularly, and she could watch all alone - on the back porch.

When the building had been about a third of the way through, Mary's parents had come out to look at what was happening. Immediately, her parents had said that the building would have to stop because the tree was untouched and very beautiful. They had said that people climbing up and down would ruin the life of the tree after awhile.

Theme 1 - Construction

Unstructured - Low frequency - Familiar

The Treehouse

There were two things Mary had perpetually wanted--a place to be alone and a place that was for bird watching. Her family was currently leasing a home in a sizeable city. Mary ascertained that there was one way she could attain both of these things. In the backyard away from the house, they had a substantial tree. She was determined to construct a treehouse in that tree. That way she could do the things she wanted, and have a salubrious place to watch birds.

Obviously she could not construct it single-handed, so she consulted her brother and some of his companions, and some of her own companions. Soon they gathered all the materials together and the construction commenced.

Mary did not know how to react. One of her companions suggested that they could modify the treehouse into a bird house to feed large numbers of birds. In this fashion, once the construction was completed, no branches would be broken. She opted to do this, and soon construction was completed.

Things eventuated even more favorably for Mary since she enjoyed herself even more by watching all the birds that came into the tree more regularly, and she could watch all alone on the back porch.

When the construction had been approximately a third of the way through, Mary's parents had come out to examine her progress. Unhesitatingly, her parents had declared that the construction would have to cease because the tree was pristine and very splendid. They had claimed that scaling up and down would devastate the life of the tree eventually.

Theme 1 - Construction

Structured - High frequency - Unfamiliar

The New Factory

There were two things the Poly Plastic Bag Company had always wanted - a factory of its own and offices that were out of the city. They were currently renting a factory in a big city when the company decided that there was one way they could get both of these things. Near a quiet river out of the city, they owned a large block of land. They made up their minds to build a factory on that land. That way they could do the things they wanted, and have a pleasant place to work.

Clearly they could not build it on their own, so they talked to a builder and some of his associates, and some of their own employees. Soon the materials had been gathered and the building begun.

When the construction was about a third of the way through, the Pollution Control Board came out to look at what was happening. Immediately the Pollution Control Board said the building would have to stop because the river was very old and beautiful. They said that the waste from the factory would ruin the beautiful river's life after a while.

The company did not know what to do. One of the workers suggested that they change the factory into a storehouse to keep large numbers of bags. This way once the building was finished, no waste materials would be produced. They decided to do this, and soon the building was finished.

Things turned out even better for the company because they could save money by producing a large number of bags and storing them in the warehouse for future sales, and that was really the most important thing.

Theme 1 - Construction

Structured - Low frequency - Unfamiliar

The New Factory

There were two things the Poly Plastic Bag Company had perpetually wanted--a factory of its own and offices that were out of the urban area. They were currently leasing a factory in a sizeable city. The company ascertained that there was one way they could attain both of these things. Near a quiet river out of the city they owned a substantial block of land. They determined to construct a factory on that land. That way they could do the things they wanted and have a salubrious place to work.

Obviously they could not construct it single-handed, so they consulted a builder and some of his associates and some of their own employees. Soon they gathered all the materials together and construction commenced.

When the construction was approximately a third of the way through, the Pollution Control Board came out to examine their progress. Unhesitatingly, this board declared that the construction would have to cease because the river was pristine and very splendid. They claimed that effluent from the factory would devastate the life in the river eventually.

The company did not know how to react. One of the employees suggested that they could modify the factory into a warehouse to keep large numbers of bags. In this fashion, once the construction was completed, no effluent would be produced. They opted to do this, and soon the construction was completed.

Things eventuated even more favorably for the company since they saved money by producing a large number of bags more regularly and keeping them in the warehouse for future sales, and they moved their offices out of the city--to the warehouse.

Theme 1 - Construction

Unstructured - High frequency - Unfamiliar

The New Factory

There were two things the Poly Plastic Bag Company had always wanted--a factory of its own and offices that were out of the city. They were currently renting a factory in a big city when the company decided that there was one way they could get both of these things. Near a quiet river out of the city, they owned a large block of land. They made up their minds to build a factory on that land. That way they could do the things they wanted, and have a pleasant place to work.

Clearly they could not build it on their own, so they talked to a builder and some of his associates, and some of their own employees. Soon the materials had been gathered and the building begun.

The company did not know what to do. One of the workers suggested that they change the factory into a storehouse to keep large numbers of bags. This way once the building was finished, no waste materials would be produced. They decided to do this, and soon the building was finished.

Things turned out even better for the company because they could save money by producing a large number of bags and storing them in the warehouse for future sales, and that was really the most important thing.

When the construction had been about a third of the way through, the Pollution Control Board had come out to look at what was happening. Immediately, the Pollution Control Board had said the building would have to stop because the river was very old and beautiful. They had said that the waste from the factory would ruin the beautiful river's life after a while.

Theme 1 - Construction

Unstructured - Low frequency - Unfamiliar

The New Factory

There were two things the Poly Plastic Bag Company had perpetually wanted--a factory of its own and offices that were out of the urban area. They were currently leasing a factory in a sizeable city. The company ascertained that there was one way they could attain both of these things. Near a quiet river out of the city they owned a substantial block of land. They determined to construct a factory on that land. That way they could do the things they wanted and have a salubrious place to work.

Obviously they could not construct it single-handed, so they consulted a builder and some of his associates and some of their own employees. Soon they gathered all the materials together and construction commenced.

The company did not know how to react. One of the employees suggested that they could modify the factory into a warehouse to keep large numbers of bags. In this fashion, once the construction was completed, no effluent would be produced. They opted to do this, and soon the construction was completed.

Things eventuated even more favorably for the company since they saved money by producing a large number of bags more regularly and keeping them in the warehouse for future sales, and they moved their offices out of the city--to the warehouse.

When the construction had been approximately a third of the way through, the Pollution Control Board had come out to examine their progress. Unhesitatingly, this board had declared that the construction would have to cease because the river was pristine and very splendid. They had claimed that effluent from the factory would devastate the life in the river eventually.

Appendix B: Questions

STORY TITLE _____

(1) How easy did you find this story to read?

____ very easy

____ pretty easy

____ pretty hard

____ very hard

(2) How well do you think you would do on a test on this story?

____ very well

____ pretty well

____ pretty poorly

____ very poorly

(3) How INTERESTING do you think this story was?

____ very interesting

____ pretty interesting

____ not too interesting

____ not at all interesting

FACTORY

1. One of the things the Poly Plastic Bag Company wanted was

   a. offices downtown
   b. new equipment for their factory
   c. offices in the country
   d. a change in zoning laws

2. The company was originally located

   a. in the suburbs
   b. at the edge of town
   c. in the city
   d. near a river

3. The company's building plans were changed

   a. before construction began
   b. when they were one third finished
   c. when they were one half finished
   d. when the building was nearly completed

4. The building was stopped because

   a. there was a complaint about the noise
   b. the building was unsafe for working
   c. the factory would spoil the river
   d. the company had failed to get a building permit

5. The new building plan

   a. was designed to store plastic bags
   b. made the factory safer to work in
   c. changed the location of the factory
   d. was suggested by the board of directors

6. In the sentence, "There were two things the Poly Plastic Bag Company had perpetually wanted," the word "perpetually" means

   a. often
   b. constantly
   c. seldom
   d. from time to time

7. In the sentence, "The construction was approximately a third of the way through," the word "construction" means

   a. act of explaining
   b. planning
   c. act of making a structure
   d. group of architects

8. In the sentence, "Things eventuated even more favorably for the company," the word "eventuated" means

   a. tried
   b. ended early
   c. began
   d. resulted

9. It was necessary to change the purpose of the building because

   a. the builders refused to complete the original plans
   b. the company no longer wanted a factory
   c. it was necessary to preserve the environment
   d. the company couldn't find the necessary materials

10. The Pollution Control Board could force a change in the purpose of the building because

    a. factories do not know how to build a building properly
    b. buildings would not look proper next to rivers
    c. the Pollution Control Board has the right to stop buildings if they are harmful to the environment
    d. often factories have too many buildings and do not need to build another one

TREEHOUSE

1. One of the things Mary had always wanted was

   a. a house downtown
   b. new furniture for her room
   c. a place to be alone
   d. a place to share with her friends

2. Mary's family lived

   a. in the suburbs
   b. at the edge of town
   c. in the city
   d. near a river

3. Mary's building plans were changed

   a. before construction began
   b. when she was one-third finished
   c. when she was one-half finished
   d. when the structure was almost complete

4. The building was stopped because

   a. there was a complaint about the noise
   b. the treehouse was unsafe
   c. the treehouse would spoil the tree
   d. Mary had failed to ask permission to build

5. The new building plan

   a. was designed to feed many birds
   b. made the treehouse safer to climb to
   c. changed the location of the treehouse
   d. was suggested by her parents

6. In the sentence, "There were two things Mary had always wanted," the word "always" means

   a. often
   b. constantly
   c. seldom
   d. from time to time

7. In the sentence, "The building was about a third of the way through," the word "building" means

   a. act of explaining
   b. planning
   c. act of making a structure
   d. group of architects

8. In the sentence, "Things turned out even more favorably for Mary," the words "turned out" mean

   a. tried
   b. ended early
   c. began
   d. resulted

9. It was necessary to change the purpose of the treehouse because

   a. Mary's helpers refused to complete the original plans
   b. Mary no longer wanted a treehouse
   c. it was necessary to preserve the environment
   d. they lost the original plans

10. Mary's parents could force a change in the purpose of the building because

    a. children do not know how to build a building properly
    b. buildings would not look proper in trees
    c. parents have the right to stop buildings if they are harmful to the environment
    d. children have too many treehouses and don't need any more

Table 1

Story Variables

THEME 1: Construction		
Exposition	Complication	Resolution
1. Main protagonists with goals of a new building	1. Outside agency requires change in original plans	Construction continues, but purpose of the final structure is changed to accommodate environmental restrictions
2. Protagonist engages help to construct building	2. Damage to environment by construction	
3. Project is almost completed		

Table 2

Manipulation of Pragmatic Constraints

	THEME I: Construction		
	Exposition	Complication	Resolution
Familiar:	1. Mary wants tree-house to watch birds; get out of the house in the city	1. Parents said it could not be finished as planned	Tree house changed to become a birdhouse
	2. Brothers, sisters, friends help build the treehouse	2. Tree was being damaged by nails and children climbing it	
	3. Project is 2/3 completed		
Unfamiliar:	1. Poly Plastic Bag Co. wants factory with more space and away from the urban area	1. EPA stopped construction as planned	Factory changed to become a warehouse
	2. Contractor hires personnel to build the factory	2. River was being polluted, wildlife destroyed by construction	
	3. Project is 2/3 completed		

Table 3

Graeco-Latin Square Used in Constructing Materials

Script 1 Poor Structure Familiar	Script 2 Good Structure Familiar	Script 3 Poor Structure Unfamiliar	Script 4 Good Structure Unfamiliar
Script 3 Good Structure Familiar	Script 4 Poor Structure Familiar	Script 1 Good Structure Unfamiliar	Script 2 Poor Structure Unfamiliar
Script 4 Poor Structure Unfamiliar	Script 3 Good Structure Unfamiliar	Script 2 Poor Structure Familiar	Script 1 Good Structure Familiar
Script 2 Good Structure Unfamiliar	Script 1 Poor Structure Unfamiliar	Script 4 Good Structure Familiar	Script 3 Poor Structure Familiar

Table 4

Means and Standard Deviations for Main Effects

Condition	Mean	Standard Deviation
Unfamiliar	6.13	1.10
Familiar	6.84	.98
Poor Structure	6.38	1.15
Good Structure	6.59	1.04
Low Word Frequency	6.41	1.11
High Word Frequency	6.55	1.09

Table 5

Means for List x Word Frequency x Familiarity Interaction

	Word Frequency			
	Low		High	
	M	SD	M	SD
List 1				
Unfamiliar	5.88	1.20	5.63	1.09
Familiar	6.19	.54	7.25	.77
List 2				
Unfamiliar	6.75	1.18	6.44	.96
Familiar	6.25	1.39	6.69	.79
List 3				
Unfamiliar	5.75	1.00	6.31	1.08
Familiar	7.13	.89	7.50	.73
List 4				
Unfamiliar	6.19	.91	6.06	1.12
Familiar	7.19	.75	6.56	.96

Table 6

Means and Standard Deviations for All Conditions

Structure	Low Topic Familiarity		High Topic Familiarity	
	M	SD	M	SD
Low Word Frequency				
Poor	-.3349	.4667	-.1644	.4814
Good	-.1968	.5627	.0303	.3466
High Word Frequency				
Poor	.0695	.6132	.1650	.3807
Good	.1309	.4546	.2772	.3730

Table 7

Means and Standard Deviations for Main Effects

Condition	Mean	Standard Deviation
Low Word Frequency	-.1664	.4826
High Word Frequency	.1606	.4656
Low Familiarity	-.0828	.5556
High Familiarity	.0770	.4268
Poor Structure	-.0662	.5245
Good Structure	.0604	.4696

Table 8

Means for Reading Ability x Treatment Interactions

	Poor Readers (N = 9)		Good Readers (N = 20)	
	M	SD	M	SD
Low Word Frequency	-.6004	.4319	.0643	.3638
High Word Frequency	-.1502	.5340	.4668	.2360
Low Familiarity	-.4916	.5772	.2270	.4106
High Familiarity	-.3090	.4639	.2638	.3301
Poor Structure	-.4895	.5936	.2085	.3560
Good Structure	-.3110	.4437	.2823	.3856

Table 9

Complication Distractor Scores as a Function of Reading Ability and Structure

Structure	Poor Readers		Good Readers	
	M	SD	M	SD
Poor	.3889	.5016	.025	.1581
Good	.1667	.3835	.025	.1581

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